



---

## Operating and Supplementing HVAC Equipment During COVID-19 Pandemic (August 2020)

Information on operating heating, ventilation, and air conditioning (HVAC) systems in schools and other buildings during the COVID-19 pandemic can be found on the Environmental Protection Agency (EPA) [Indoor Air and Coronavirus \(COVID-19\)](#), the American Society of Heating, Refrigeration and Air Conditioning Engineers' (ASHRAE) [Reopening of Schools and Universities](#) and The Centers for Disease Control and Prevention (CDC) [Considerations for Schools](#) web pages. Key points from these sites address the basic operation and maintenance of an HVAC system and include information on supplemental technologies that can potentially be used in certain situations to augment the existing HVAC system. Currently the most referenced supplemental technologies are:

- High Efficiency Particle Air Filters (HEPA)
- Ultraviolet Germicidal Irradiation (UVGI)
- Ozone
- Bi-Polar Ionization.

Generally, increasing ventilation and filtration effectiveness is appropriate for most applications. It is suggested that when these actions are not possible or in a high-risk area such as a hospital waiting room, the use of supplemental technologies should be considered. Both EPA's and ASHRAE's web pages contain information on the supplemental technologies listed above, including their effectiveness, advantages, disadvantages, and historical applications. Administrative controls such as limiting the number of people present in the building and encouraging people who feel ill to remain at home should also be considered and implemented if feasible.

Current recommendations indicate that spaces that are not occupied for 7 or more days do not require additional SARS CoV-2 disinfection actions. In certain situations, keeping spaces unoccupied for 7 or more days may provide a low cost, non-technical solution. However, in this situation, building ventilation and water systems may require re-occupancy preparation as outlined in ASHRAE's and CDC's guidance.

Prior to any existing system evaluation or system modifications, the building owner should review the air balancing report for the air handling system(s) installed in the building. An air balancing report is required by [Wisconsin Admin. Code ch. SPS 364.0313](#). The air balancing report will create a baseline for professionals to evaluate how the system was originally designed to operate, and how it should be operating, at this time.

The air balancing report provides insight as to the possibility of addressing additional supply air to specific building areas, as well as the possibility of incorporating additional outside air into the air handling system(s). One should note that providing too much outside air may cause HVAC equipment failure due to excessively cold air passing over the heat exchanger. Failures can occur when the heat exchanger cracks due to extreme temperature differentials between the heat created by the burners in the exchanger and the cold outside air brought into the system for tempering purposes.

Similarly, installing a more effective HVAC filter may have negative effects on the HVAC system. When a more effective filter is installed, the HVAC system must work harder to push air through the filter which puts a strain on the system's motor and may cause the motor to fail.



---

## Supplementing HVAC Equipment During COVID-19 Pandemic

### **Stand Alone HEPA or UVGI Units**

With all the information out there regarding the use of High Efficiency Particle Air Filters (HEPA) and Ultraviolet Germicidal Irradiation (UVGI) to control exposure to SARS-CoV-2, it may be difficult to determine whether the use of these technologies would be beneficial as a supplement to your existing Heating, Ventilation and Air-Conditioning (HVAC) system. Below are some highlights and links to additional resources for you to consider when determining whether to invest in one of these technologies.

The American Society of Heating, Refrigeration and Air Conditioning Engineers' (ASHRAE) Technical Resources web page provides a summary of both UVGI and HEPA filtration as a potential means of reducing SARS CoV-2 exposure in buildings. Other technologies are also covered, but UVGI and HEPA filtration are the two most referenced technologies when discussing HVAC systems.

While the scientific data for the effectiveness of both UVGI and HEPA filtration in controlling SARS CoV-2 is just beginning to be published, these technologies have been proven effective in controlling similar viruses. For information on what claims product manufacturers can make regarding their ability to control SARS CoV-2, please see: [EPA Compliance Advisory: What You Need to Know Regarding Products Making Claims to Kill the Coronavirus Causing COVID-19](#)

### **UVGI**

For background information on UVGI please see: [IES Committee Report: Germicidal Ultraviolet \(GUV\) - Frequently Asked Questions](#). Historically, UV-C has been used in healthcare, water treatment and other settings to control bacteria, viruses, and molds both on surfaces and the air. In healthcare settings UV-C has been used as a means of controlling airborne Tuberculous and other infectious agents by installing specially placed UV-C lamps or using portable UV-C units.

In HVAC systems UV-C has been used to control mold and bacteria on duct surfaces and other HVAC components. In part, the effectiveness of UV-C depends on the "dwell time" and "power" of the UV-C source. (A more detailed explanation can be found in [IES Committee Report: Germicidal Ultraviolet \(GUV\) - Frequently Asked Questions](#)) For example, the portable UV-C units used in hospital settings to disinfect rooms are remotely controlled units, where no one can be present during their operation.

When discussing UV-C for in duct air cleaning, as noted in the [Technical Resources](#), *UV-C In-Duct Air Disinfection* section, a high UV dose is needed due to the short time period the air will be exposed to the UV-C. Whereas a UV-C system installed for treating surface cooling elements, drain pans and other wetted surfaces can utilize a lower irradiance since these components are stationary.

While safety training needs to be provided for all UV-C systems, safety measures such as interlocks, remote controls, and personal protective equipment (PPE) is dependent on the specific UV-C system. Employees who may be exposed to UV-C need to understand how exposure to UV-C can result in skin and eye damage which may not be noticed until several hours after the UV-C exposure as well as the PPE and engineering controls in place to prevent exposure.

The Summary Advantages and Disadvantages Tables found in the [IES Committee Report: Germicidal Ultraviolet \(GUV\) - Frequently Asked Questions](#) document provides an overview of UV-C products and historic applications.



It is important to remember that there are no national standards adopted by the Wisconsin Commercial Building Code for application to these types of supplemental equipment. The Wisconsin Commercial Building Code does not require this type of equipment to be installed, nor does the Wisconsin Commercial Building Code prohibit such equipment installations.

### **Portable/Stand-Alone HEPA Air-Filtration Units**

The Association of Home Appliance Manufacturers (AHAM) has a web page which explains how the effectiveness of portable/stand-alone air cleaners is determined and provides some guidance on choosing a unit based on the size of the room where it will be used : [AHAM Air Filtration Standards](#) . Two additional documents which provide more in depth information on these units can be found on AHAM web site at: [Method for Measuring the Performance of Portable Household Electric Room Air Cleaners, Understanding its Scope and the Related AHAM Industry Certification Program](#) and [Frequently Asked Questions about Testing of Portable Air Cleaners](#) .

Some factors to consider when determining whether to invest in portable/stand-alone HEPA air-filtrations units are as follows:

- the room size in square feet and the height of the ceiling, if the ceiling height is greater than 8 feet
- the number of units that will be needed for the room
- the noise rating of the unit(s)
- the cost and availability of the filters,
- the filter change-out frequency
- a written process, training and any personal protective equipment needed for changing out the used filters.

As mentioned on the AHAM web page, the Clean Air Delivery Rate (CADR) of the air cleaning unit should be equal to at least two-thirds of the room size in square feet. For example, a room cleaner with a smoke CADR of at least 80 would be needed for a 120 ft<sup>2</sup> room with an 8-foot ceiling. Rooms with ceiling heights greater than 8 feet would need a higher rated CADR unit.

The noise level of the air cleaning unit is also an important factor to consider. The CADR is obtained by using the highest fan speed, which may not be practical to use in settings that require low background noise levels. Additionally, the noise level from the use of multiple units may also not be practical in some settings.

### **Ozone**

While the disinfection capabilities of ozone has been recognized, very high levels of ozone are needed to be effective, and that the use of ozone should only be considered for unoccupied spaces. Additionally, written protocols for entering spaces where ozone has been used for disinfection should include accurate measurement of ozone levels, personal protective equipment for entering the space to measure ozone levels, restricting access to the space until safe levels have been determined and training.



### **Bipolar Ionization**

As a method to supplement your HVAC system in terms of airborne transmission control of SARS CoV-2, both ASHRAE and the EPA state that scientific peer-reviewed studies are lacking for the effectiveness of Bipolar Ionization.

As mentioned in the ASHRAE Filtration and Disinfection FAQ document, currently, there are no disinfectants specifically approved by EPA for use inside ventilation systems. When considering products for cleaning and disinfecting in general, it's important to keep in mind that you do not create a subsequent hazard by improperly using cleaning/disinfection products or unnecessarily hazardous products when "less hazardous" products are available. For example, EPA's [Safer Choice Cleaning Products](#) site provides information on products which are considered less hazardous.

### **Summary**

When considering whether to purchase either a UVGI or stand-alone/portable HEPA air-filtration unit to supplement your existing ventilation system, it's important to understand how these units work and where they work best. It is also important to be cautious of units that make claims that are not substantiated by a third party or scientific review. The EPA's [Air Cleaners, HVAC Filters, and Coronavirus \(COVID-19\)](#) web page provides additional links and resources for information on indoor air quality, air cleaners and air filters.